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What make African happy?

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Abstract. *This paper analyses the key determinants of happiness in Africa. Using both Bayesian Model Averaging (BMA) and Weighted Average Least Squares (WALS) approaches to tackle the issue of model uncertainty on a panel of 30 African countries over the period 2006-2017, we found 14 economic, social, cultural, historical, structural and institutional factors which influence African well-being.*

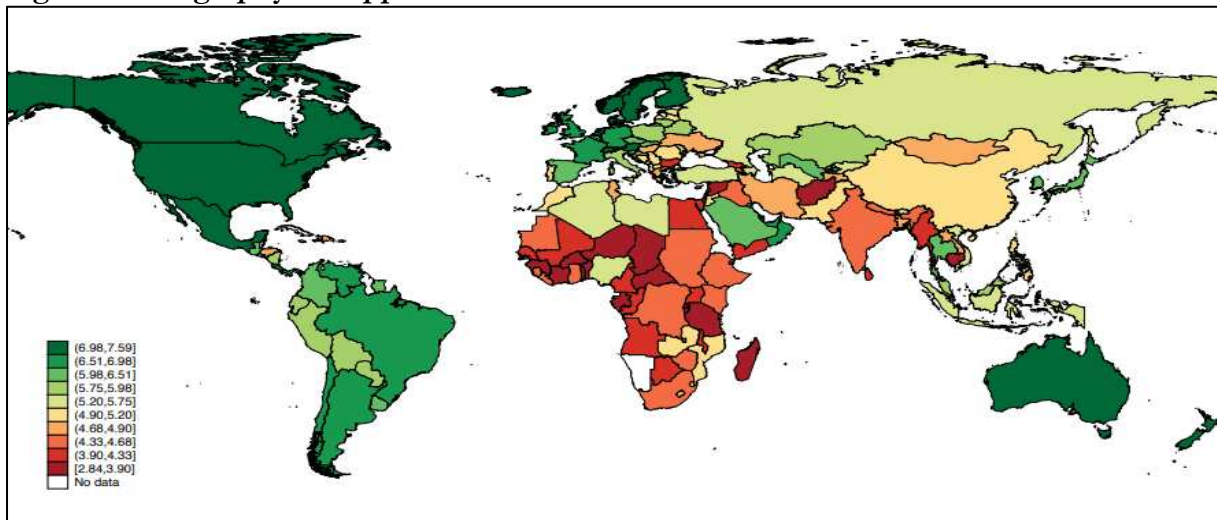
Keywords: Determinants, Happiness, Africa, Bayesian Model Averaging, Weighted Average Least Squares.

JEL classification: I31, O55, C11.

1. Introduction

Africa remains the least developed and least advanced continent in the world (World Bank, 2019)¹. The economic situation is progressing rapidly but raises a question in the context of strong growth in its demography, and of its ability to cope with increase in mass unemployment and poverty. Likewise, the institutional framework is unstable in most countries and presents an obstacle to its economic and social development. According to the World Happiness Report (WHR), whose objective is to integrate well-being into public statistics, more than 80 % of African countries appear in the second half of the report's ranking (Helliwell et al., 2019). As shown in Figure 1, which present the geography of happiness around the world, no country on the continent has a score higher than 5.

Figure 1 : Geography of happiness



Source: Helliwell et al. (2015, p. 20)

A large number of direct determinants of well-being and happiness have been identified in the literature. Along with other social scientists, economists have begun to study the patterns in subjective well-being data. Some of the main economics references include Easterlin (1974, 1995), Clark and Oswald (1994), Winkelmann and Winkelmann (1998), Frey and Stutzer (2000), Di Tella

¹ According to the 19th edition of the *Africa's Pulse Report*, economic performance in 2018 was mixed.

et al. (2001, 2008), Blanchflower and Oswald (2004), Helliwell and Huang (2008), Ott (2011), Frey (2018). Globally, according to these authors people with higher incomes unambiguously consider themselves to be more satisfied with their lives than people with low income. Likewise, people losing their jobs are much more dissatisfied with their lives than those keeping or still having their jobs. Among the socio-demographic influences, married people are happier than unmarried people. Physical and psychological health also contribute strongly to well-being. Cultural differences also matter, as religious persons are demonstrably happier than those who do not belong to a religious community. Moreover, happiness is positively influenced by governance, democracy and political decentralization (Njangang, 2019; Frijters et al., 2019).

In view of the above, it appears that well-being is a polysemic concept which depends on several determinants. Thus, the main objective of this paper is to analyze the key determinants of happiness in Africa. To do so, we use data from WHR (2018) on a panel of 30 African countries over the period 2006-2017 and analyze the impact of 25 factors on Africans' well-being.

Our contribution to the literature is threefold. First, to the best of our knowledge, this is the first paper which utilizes a much broader range of potential determinants (i.e. 25 determinants) of happiness in African countries. Second, comparing to the existing studies, this paper tackles the issue of model uncertainty when identifying these determinants by using both Bayesian Model Averaging (BMA) and Weighted Average Least Squares (WALS) approaches. Third, this study explains well-being in Africa through economic, social, cultural, historical, structural and institutional factors. As a result, we identify a total of 11 factors that promote the well-being of Africans, namely: per capita income, health, employment rate, population growth rate, education (secondary level), religion (Catholic and Muslim), governance (control of corruption, government effectiveness and political stability) and energy infrastructure. Conversely, we identify 3 factors having a negative impact on happiness in Africa: urbanization, the colonial past and linguistic fractionalization.

After this introduction, the rest of paper is organized as follows. Section 2 discusses the potential determinants of happiness. Section 3 describes the data and methodology. Section 4 presents and analyses the results. Section 5 checks their robustness and section 6 concludes.

2. Background of the determinants of happiness

Various studies have focused on identifying the determinants of happiness. Without claiming to be exhaustive, we can group them into two categories, namely economic and non-economic factors.

The relationship between income and subjective well-being has been the object of extensive empirical research. The results are clear: people with higher income unambiguously consider themselves to be more satisfied with their lives than people with low income (Frey, 2018). Income, both from a national comparative level across countries (such as income per capita) and the different levels of income in a specific country, has been found to show that people with higher incomes are happier than people with lesser incomes at a specific point in time (Easterlin, 2001; Frey and Stutzer 2002). Moreover, cross-national comparisons of income levels and subjective well-being suggest that improvements on the basic needs of people living in poorer countries will have a far greater impact than income gains in wealthier countries (Diener and Diener, 1995). Other studies have explored the reverse direction of causality, and find that people with higher happiness levels tend to perform better in the labor market and to earn more income in the future (Diener et al., 2003; and Graham et al, 2004). Another economic factors that have been largely discussed in the literature are inflation and unemployment. For this purpose, Di Tella et al. (2001), Frey and Stutzer (2001) show that people appear to be happier when inflation and unemployment are low.

Concerning non economics factors, many studies related that age, children, marriage, education, religion, institutions and happiness have a strong relationship with happiness. Michalos (1991)

show that within countries, demographic factors such as age, education, socio-economic status and race tend to explain people well-being. Frey (2018) establishes a clear U-shaped relationship between age and life satisfaction. Children's effects on happiness from literature are mixed. Kohler (2015) shows that the expected happiness gains from children differ importantly from institutional contexts, especially at higher parities. Some other studies have shown that changes in happiness after having children varies across countries (Aassve et al., 2008). Dykstra and Keizer (2009) and Hansen et al. (2009) show that the effect of having children on happiness is quite small for both males and females in the age range 50–70. Among the effects of marriage, Studies show that married people are happier than unmarried people (Stutzer and Frey, 2006; Kislev, 2018; Lawrence et al., 2019).

Studies however have mixed results on the effect of education on marriage. While Shields et al. (2009) and Powdthavee et al. (2015) documented a negative correlation between education and subjective well-being, Nozick (1989), Nikolaev and Rusakov (2016) and Nikolaev (2018) argue that the effect of education on happiness depends on age group. Moreover, researchers show that subjective well-being differs considerably between countries and cultures. Globally, they argue that religious people have proven to be happier than those who do not belong to a religious community (Frey, 2018; Minkov and Schachner, 2020). Regarding institutional factors, institutional conditions and political systems are a major determinant of human happiness. Bjørnskov et al. (2010) find that, formal institutions increase subjective well-being. Graham and Sukhtankar (2004) find a strong positive correlation between happiness and preference for democracy. Likewise, Helliwell and Huang (2008), Ott (2011), Njangang (2019), Frijters et al. (2019) show that good governance is a significant determinant of happiness. In addition, much of the literature finds that political arrangements like trust and freedom have positive effects on happiness (Helliwell, 2003; Layard, 2005).

Given lack of consensus on the extent of the determinants of happiness, we opt for a global approach to analyze the economic, social, cultural, historic, structural and institutional determinants of happiness in the context of African countries.

3. Empirical strategy

3.1. Methodology: Bayesian model averaging (BMA)

We analyse the key determinants of happiness in Africa using a Bayesian approach, namely the Bayesian model averaging (BMA). This approach is very useful in addressing model uncertainty in a canonical regression specification. Specifically, it addresses two major issues that typically arise in empirical studies with a relatively large number of explanatory variables, and for which classical regression models do not provide an effective response. These issues are the inclusion of variables in the model and their respective importance². To make this point clear, let us assume that our model is a linear regression of the following form:

$$y = \alpha_\gamma + X_\gamma \beta_\gamma + \varepsilon, \quad \varepsilon \sim N(0, \sigma^2 I) \quad (1)$$

Where y is the dependent variable (i.e. happiness), α_γ and β_γ denote the intercept and the coefficient respectively, X_γ is a matrix of explanatory variables (i.e. potential determinants of happiness) and ε is an iid error term whose variance is σ^2 .

The main question is which variable enter into the matrix X_γ , among a host of potential explanatory variables? In principle, the choice of $X_\gamma \in \{X\}$ to be included in the model must be based on their relative importance. In the canonical linear regression problem, a single model contains all the

² For more technical details, see Raftery et al. (1997); Hoeting et al. (1999); Fernandez et al. (2001) and Magnus et al. (2010).

explanatory variables, rendering the approach inefficient or even unfeasible with a limited number of observations (see Chipman et al., 2001). The BMA approach tackles this model uncertainty problem by estimating models for all possible combinations of $\{X\}$ and constructing a weighted average over all of them (see Feldkircher and Zeugner, 2015). Supposing that X contains K potential variables, the BMA approach assumes to estimate 2^K models, each with a certain probability of being the “true” model. Bayes theorem provides the useful guide for obtaining model weights, which are estimated from the posterior model probabilities. Using the Bayes theorem, we establish that:

$$p(M_\gamma|y, X) = \frac{p(y|M_\gamma, X)p(M_\gamma)}{p(y|X)} = \frac{p(y|M_\gamma, X)p(M_\gamma)}{\sum_{s=1}^{2^K} p(y|M_s, X)p(M_s)} \quad (2)$$

Where $p(y|X)$ is the integrated likelihood which is constant over all models, and is thus simplified in a multiplicative term. Hence, the Posterior Model Probability (PMP) is proportional to the integrated likelihood $p(y|M_\gamma, X)$, which reflects the probability of the data given model M_γ . The term $p(y|M_\gamma, X)p(M_\gamma)$ shows how the researcher believes model M_γ is probable prior to observing the data. $p(y|X)$ and $p(y|M_\gamma, X)$ are different in the sense that integration is done over the model space $p(y|X)$ but for a given model over the parameter space $p(y|M_\gamma, X)$.

Then, we can infer the Posterior Model Probabilities (PMPs) and the model weighted posterior distribution for any parameter θ by renormalizing Eq. (2) such that³ :

$$p(\theta|y, X) = \sum_{\gamma=1}^{2^K} p(y|M_\gamma, y, X) \frac{p(y|M_\gamma, X)p(M_\gamma)}{\sum_{s=1}^{2^K} p(y|M_s, X)p(M_s)} \quad (3)$$

As Fernandez et al. (2001), we choose a uniform prior probability that means a common prior model probability, i.e. $p(M_\gamma) = 2^{-K}$. This implies that, the prior probability of including a regressor is $1/2$ independently of the other regressors included in the model. Thus following Hoeting et al. (1999), the posterior mean and variance of θ are respectively given by:

$$E(\theta|y, X) = \sum_{\gamma=0}^{2^K} E(\theta|y, X, M_\gamma)_\gamma p(M_\gamma|y, X) \quad (4)$$

$$V(\theta|y, X) = \sum_{\gamma=0}^{2^K} (V(\theta|y, X, M_\gamma) + E(\theta|y, X, M_\gamma)_\gamma^2) p(M_\gamma|y, X) - E(\theta|y, X)^2 \quad (5)$$

3.2 Data

The data used cover 30 African countries over the period 2006-2017⁴. The size and period of study are limited by the availability of the data on happiness. The dependent variable is the subjective well-being measured by life ladder (Easterlin, 2004; Helliwell et al., 2018; Njangang, 2019).

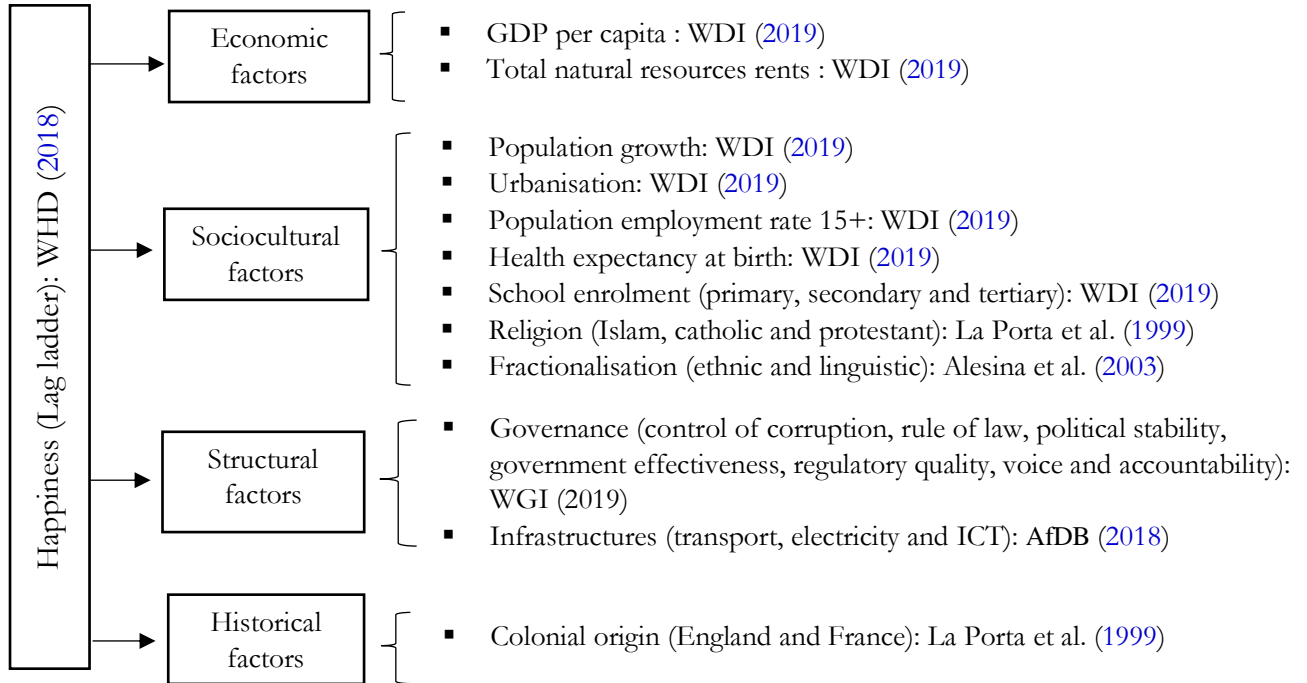
Our potential determinants of subjective well-being can be summarized in four different areas:

³ Eq. (3) is very crucial because all relevant posterior computations are based on it. For example, we can compute the posterior moments of the coefficient vector β_γ , which is a weighted average over all models. Similarly, we can also compute the Posterior Inclusion Probabilities (PIPs), which can be used to evaluate the importance of each explanatory variable (i.e. determinants of happiness) in the model. This is computed as the sum of probabilities for all models in which the covariate is included (see Feldkircher and Zeugner (2015)).

⁴ Benin, Botswana, Burkina Faso, Cameroon, Chad, Congo, DR Congo, Egypt, Gabon, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

economic factors, socio-cultural factors (social, demographic and cultural), structural factors (governance and infrastructure quality) and historical factors (colonial origin). The summary of all the variables as well as the data sources are presented in Figure 2.

Figure 2: variables descriptions and sources



Note: authors' construction. This figure presents a total of 25 variables that could potentially explain happiness in Africa. The acronyms WHD, WDI, WGI and AfDB respectively designate the World Happiness Database, World Development Indicators, Worldwide Governance Indicator and African Development Bank.

4. Results

Table 2 shows the Posterior Inclusion Probabilities (PIPs) of each determinant, the Posterior Mean (PM), and the Posterior Standard Deviation (PSD) of the posterior distribution for the associated parameter. These results are based on 500.000 posterior draws and 100.000 burn-ins (see Gelman et al., 2000). As a rule of thumb, the importance of the determinants in the model can be interpreted in terms of their PIPs as follows: 50-75% (PIP is weak); 75-95% (PIP is substantial); 95-99% (PIP is strong); and 99%+ (PIP is decisive) (see Eicher *et al.*, 2009; Cuaresma *et al.*, 2014). Hence, an explanatory variable whose PIP is greater than the threshold of 0.5 is considered as robust.

Concerning economic factors, we find a positive and strong relation between GDP per capita and happiness index (PIP value greater than 95%). In other words, the increase in per capita income is associated with an increase in well-being in Africa. This result confirms the results of the abundant literature which suggests that people with higher income unambiguously consider themselves to be more satisfied with their lives than people with low income, because high income seems to raise consumption, health, educational level, and employment respectively. Moreover, as documented by Easterlin (2001), Stevenson and Wolfers (2013) and Wu and Li (2017), people living in rich countries are on average considerably happier than those living in poor countries, taking into account the different costs of living. Regarding natural resources, although the effect of their rent is not significant (PIP value is less than 50%), the latter remains positively linked to happiness. This result remains consistent with the wealth of the African continent in natural resources (AfDB, 2018). Thus, a better exploitation of these resources coupled with an equitable redistribution could be presented as a means to fight against poverty and access to happiness.

Table 1. Determinants of happiness in Africa: BMA results

Determinants	Dependant variable : life ladder		
	BMA PIP	PM	PSD
GDP per capita	0.98	0.25	0.06
Natural resources rents	0.42	0.11	0.03
Health	0.07	0.12	0.05
Employment	0.88	0.23	0.02
Population growth	0.39	-0.01	0.05
Urbanisation	0.67	-0.01	0.02
Primary education	0.05	0.00	0.08
Secondary education	0.59	0.37	0.18
Tertiary education	0.46	0.20	0.03
Protestant religion	0.16	0.00	0.04
Muslim religion	0.58	0.18	0.10
Catholic religion	0.67	0.37	0.02
Language fractionalization	0.61	-0.03	0.11
Ethnic fractionalization	0.44	-0.16	0.37
French colonisation	0.41	-0.01	0.05
Britannic colonisation	0.48	-0.15	0.19
Control of corruption	0.78	0.52	0.09
Government effectiveness	0.98	0.43	0.31
Political stability	0.11	0.01	0.04
Regulatory quality	0.84	0.56	0.31
Rule of law	0.47	0.19	0.11
Voice and accountability	0.07	-0.01	0.04
Transport	0.19	0.00	0.06
Electricity	0.58	0.37	0.08
ICT	0.05	0.00	0.01

Note: authors' estimates. All computations are based on and 500,000 posterior draws and 100,000 burn-ins. Simulations are based on uniform information prior. Statistics in bold are those for which the posterior inclusion probability is greater than 50%.

Regarding the sociocultural determinants, we find that employment rate strongly promotes happiness in Africa (PIP greater than 75%). This result goes in the same direction as those of Frey and Stutzer (2002) who established that employment promotes well-being more than any other social factor. These authors also concluded that unemployment in general makes people unhappy, even if people have not experienced it personally. However, we found that urbanization reduces happiness. This result can be explained by the negative externalities of urbanization, particularly with regard to unsanitary conditions, insecurity in cities and the pollution of the urban environment. In addition, education as measured by high school enrollment is positively associated with happiness. Our finding is coherent with those of Cuñado and de Gracia (2012) and Chen (2012) who claimed that education leads to a better quality of life, which results from relative higher income and stable job status. In other words, people with a higher education might have higher possibilities of obtaining high paid and relatively well conditioned jobs. Another concern was to study the impact of religions on happiness. Our results show that being a Catholic or a Muslim increases happiness in Africa, confirming those of Greeley and Hout (2006), Lim and Putnam (2010) and Clark (2011). For this group of authors, religious people have been shown to be happier than those who do not belong to a religious community. According to them, a religious community offers access to support or enables individuals to cope with stress and or to adapt preferences or aspirations, offers a sense of meaning and purpose, and acts as a moral compass in present life as well as the 'after-life'.

Among structural factors, we find that the control of corruption, government effectiveness and political stability substantially promote happiness (GDP value around 75-95%). So, the well-being of the population depends largely on political decision-makers, in particular on the perceptions of the extent to which public power is exercised for private gains, the credibility of the government

commitment to such policies including corruption and the stability of government. These results, which go in the same direction as those of Moler et al. (2017) and Njangang (2019) suggest that, improving governance quality can enhance significantly the happiness of African population. As for the influence of the quality of infrastructure, we find that energy, although weakly, promotes happiness. Thus, as recognized by the Sustainable Development Goals (SDGs) defined by the United Nations, access to electricity is a decisive issue for the continent because lack of power strongly hinders economic development.

5. Robustness check: Weighted Average least Squares (WALS) as an alternative to BMA

As a robustness analysis, we use the weighted average least squares (WALS) approach as an alternative to BMA. This approach is claimed to be theoretically and practically robust than standard BMA and General-to-Specific model (GETS). According to Magnus et al. (2010), it is theoretically more interesting because it treats our ignorance about the priors in different manner, thereby obtaining a better risk profile and, in particular, avoiding unbounded risks; and it is practically superior because the space over which we need to perform model selection increases linearly rather than exponentially in size. Thus, with twenty five regressors to search over time, computing time of the standard BMA is of the order 2^{25} , while that of WALS is of the order 25. The implementation of this approach is presented in Tables 2. Regressors are considered to be robustly correlated with the outcome if the t-ratio on its coefficient is greater than the one in its absolute value or, equivalently, the corresponding one-standard error band does not include zero.

Table 2. Robustness check: WALS results

Determinants	Dependant variable : life ladder		
	t-ratios	Coef.	Std. Err.
GDP per capita	1,96	0,33	0,17
Natural resources rents	-0,92	0,00	0,01
Health	2,23	0,04	0,02
Employment	1,59	0,01	0,01
Population growth	1,15	0,18	0,15
Urbanisation	-1,1	-0,08	0,07
Primary education	0,6	0,00	0,01
Secondary education	-0,4	0,00	0,01
Tertiary education	-0,54	-0,01	0,02
Protestant religion	-0,62	-0,01	0,01
Muslim religion	1,03	0,00	0,00
Catholic religion	2,15	0,02	0,01
Language fractionalization	-1,66	-0,74	0,45
Ethnic fractionalization	0,52	0,36	0,68
French colonisation	0,51	0,07	0,14
Britannic colonisation	-1,56	-0,29	0,19
Control of corruption	1,13	0,28	0,25
Government effectiveness	2,72	0,76	0,28
Political stability	1,62	0,16	0,10
Regulatory quality	1,83	0,47	0,26
Rule of law	0,05	0,01	0,29
Voice and accountability	-0,07	-0,01	0,13
Transport	0,9	0,01	0,01
Electricity	-0,48	0,00	0,00
ICT	0,49	0,00	0,01

Note: authors' estimates. Statistics in bold are those for which $t \text{ ratios} > |-1|$.

Our results are in perfect harmony with the results of the BMA approach. Indeed, in both cases, the same variables are selected by the two approaches. Even more striking, the estimated parameters retaining the same signs (except for secondary education and electricity index, which had a positive effect on happiness with the BMA approach, become not significant) reflecting the robustness of our selected determinants. In addition, beyond the 10 determinants estimated with the BMA approach, we also identify 3 additional determinants, namely health and population growth both with a positive effect on happiness, and British colonization which reduces happiness. The positive effect of health on happiness confirms the results of Helliwell et al. (2018), who found that countries with higher health expectancy at birth have also been documented to be associated with higher level of happiness. Similarly, we provide empirical evidence that the colonization of African economies would have left a legacy that today can have effects on the various dimensions of well-being such as postcolonial political development (Lange, 2004), democracy (Olsson, 2009) and the agents' trust in their relatives and institutions (Nunn and Wantchekon, 2011).

6. Concluding remarks

This paper examines the robust determinants of happiness in Africa under model uncertainty by utilizing both the BMA and WALS approaches. The paper brings some new contributions into the literature. We find 14 economic, social, cultural, historical, structural and institutional factors which impact the well-being of Africans, namely: per capita income, health, employment rate, population growth rate, secondary education, religion (Catholic and Muslim), governance (control of corruption, government effectiveness and political stability), energy infrastructure, urbanization, colonial past and linguistic fractionalization. Given the development challenges that Africa currently faces, it may certainly take a while before people in Africa join the happiest people on the globe. However, this study intends to contribute to shedding light on the main factors on which political decision-makers should rely in the formulation of policies intended to boost the well-being of African populations.

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Appendix

Variables	Definitions	Obs	Mean	Std. Dev.
Life ladder	This variable is obtained by inviting respondents to think of their lives as a ladder, with the worst possible life for them as 0, and the best possible life as 10.	297	4,26	0,56
GDP per capita	Sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	360	7,86	0,84
Natural resources rents	Sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	360	15,32	11,56
Health	Life expectancy at birth	297	51,17	5,28
Employment	Employment to population ratio, 15+, total (%)	360	63,67	14,15
Population growth	Exponential rate of growth of midyear population from year t-1 to t	360	2,65	0,65
Urbanisation	People living in urban areas	360	3,86	1,16
Primary education	School enrolment, primary (% gross)	297	103,03	19,04
Secondary education	School enrolment, secondary (% gross)	217	43,96	22,73
Tertiary education	School enrolment, tertiary (% gross)	235	10,64	9,01
Protestant religion	Percentage of the population of each Country belonging to the Protestant religion in 1980.	360	13,18	12,50
Muslim religion	Percentage of the population belonging to the Muslim religion in 1980.	360	33,94	32,43
Catholic religion	Percentage of the population belonging to the Roman Catholic religion in 1980.	360	18,15	17,16
Language fractionalization	Probability that two randomly selected persons from a given country will not speak the same language.	336	0,68	0,27
Ethnic fractionalization	Probability that two randomly selected persons from a given country will not belong to the same ethnic group.	348	0,69	0,21
French colonisation	Variable dummy for the countries colonized by the French the British	360	0,50	0,50
Britannic colonisation	Variable dummy for the countries colonized by British	360	0,37	0,48
Transport	Composite index of total paved roads and total road network in KM.	360	8,11	10,06
Electricity	Total electricity production of a given country, including the energy imported from abroad.	360	8,37	16,74
ICT	Composite index of total phone subscriptions, number of internet users, fixed broadband internet subscribers and international internet bandwidth.	360	5,51	9,06
Control of corruption	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption	348	-0,67	0,49
Government effectiveness	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	348	-0,74	0,53
Political stability	Perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.	348	-0,63	0,81
Regulatory quality	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	348	-0,62	0,52
Rule of law	Perceptions of the extent to which agents have confidence in and abide by the rules of society.	348	-0,67	0,53
Voice and accountability	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	348	-0,50	0,60

Note: authors' constructions.